

APPENDIX E

WATER DETECTION (AQUA-GLO) TEST

EQUIPMENT

To test aviation fuels for undissolved (free) water, use the Aqua-Glo III ultraviolet detector kit as shown in Figures E-1A and E1B, page E-1 and page E-2. The standard test method for undissolved water is ASTM D 3240-86a. The following equipment is required to perform this test:

Aqua-Glow series III Free Water Detector Unit

The Aqua-Glo series III determines the degree of undissolved water content. The ultraviolet lamp assembly has a single, permanent fluorescing standard, positioned under a photographic-type iris diaphragm that can be opened or closed to increase or decrease the amount of ultraviolet light. The water content is determined by adjusting the diaphragm lever arm until the fluorescing standard and the test pad shows equal brightness in the ultraviolet light. The balance is reached when the zero-centering ammeter reads ZERO. The amount of water is read PPM on the diaphragm lever arm scale that has been precalibrated in the factory.

Test Pads

The fuel sample passes through a uranine dye-treated filter pad. Free water in the fuel reacts with the uranine dye. When the pad is illuminated by ultraviolet light, the dye contacted by the free water will fluoresce a bright yellow. The pad is packaged in a hermetically sealed packet. The test pads are packaged 50 to a box.

Test Pad Holder and Sample Line

A test pad holder and sample line are used to draw the fuel sample through the test pad. The test pad holder is coupled to a sampling coupler mounted on the downstream side of the filter/separator.

Paper towels or blotters

Paper towels or blotters are used to remove excess fuel from the test pad before testing is conducted for free water.

Tweezers

Tweezers are used at all times when the test pad is being handled.



Figure E-1A. Aqua-Glo Series III ultraviolet detector kit



Figure E-1B. Aqua-Glo Series III ultraviolet detector kit

TEST PREPARATION

To ensure accurate free water detection, the Aqua-Glo III detector must be assembled for operation and calibrated before each use and after every hour of use. These procedures are described below:

- Slide the meter assembly into the track on the ultraviolet lamp assembly.
- Turn on the water detector, setting the indicator switch to the appropriate power source: set to AC (50 or 60 Hz, 110-120v, using power cord), internal battery, or external battery (using external battery cord). See Figure E-2, page E-3. When using the internal battery, ensure the battery is charged if the battery is in a low or no battery power condition. A low battery condition can be identified by sluggish response of the meter or failure of the detector to stay calibrated during two successive tests. Use of the detector in a low or no battery condition will provide inaccurate test results.
- Remove the calibration pad stored in the kit. Always handle the pad with tweezers. The pad is covered with a clear plastic shielding and has a coding standard written on one side. Note the "SET" code in the center of the pad, this is the calibration setting you will use for calibrating. The sample pad in Figure E-3, page E-3, has a calibration set code of "5.3." Ensure that the calibration and fluorescing standard are a matched set. The fluorescing standard located under the hinged light shield has an alphanumeric code, and should match the code on the calibration standard. Although the "SET" numbers on the standards may or may not be the same, the code for the standards must be the same. You should label or mark the detector with the calibration/fluorescing code to ensure the proper pad is used during calibration. Matched standard sets can be ordered under NSN 6630-01-245-5989.
- Using tweezers, insert the calibration pad in the test area window located on the bottom of the water detector. Lift the covers curved metal tab and place the pad (text facing you) in the depressed circular area in the center of the test area as shown in Figure E-4, page E-4. Close the test area cover and stand the water detector upright.
- Position the light-modulator lever, located on the side of the water detector, until the lever is directly above the number on the scale corresponding to the set number shown on the calibration pad as shown in Figure E-5, page E-4.
- Depress the switch button on the instrument pack and read the calibration meter. If the meter reads "0," the water detector is calibrated as shown in Figure E-6, page E-5. If the meter reads any increment other than "0," you must adjust the internal calibration screw until the water detector is "zeroed-out."
- To adjust the internal calibration screw, remove the outer screw on the side of the calibration meter housing using the jeweler's screwdriver. Insert the jeweler's screwdriver into the housing and turn the internal adjustment

screw. Depress the switch button on the instrument pack as you turn the screw until the meter lever reads "0." Replace the outer screw and the water detector is calibrated. See Figure E-7, page E-5.

- Remove the calibration pad from the test area, using tweezers, and place it back in the kit.

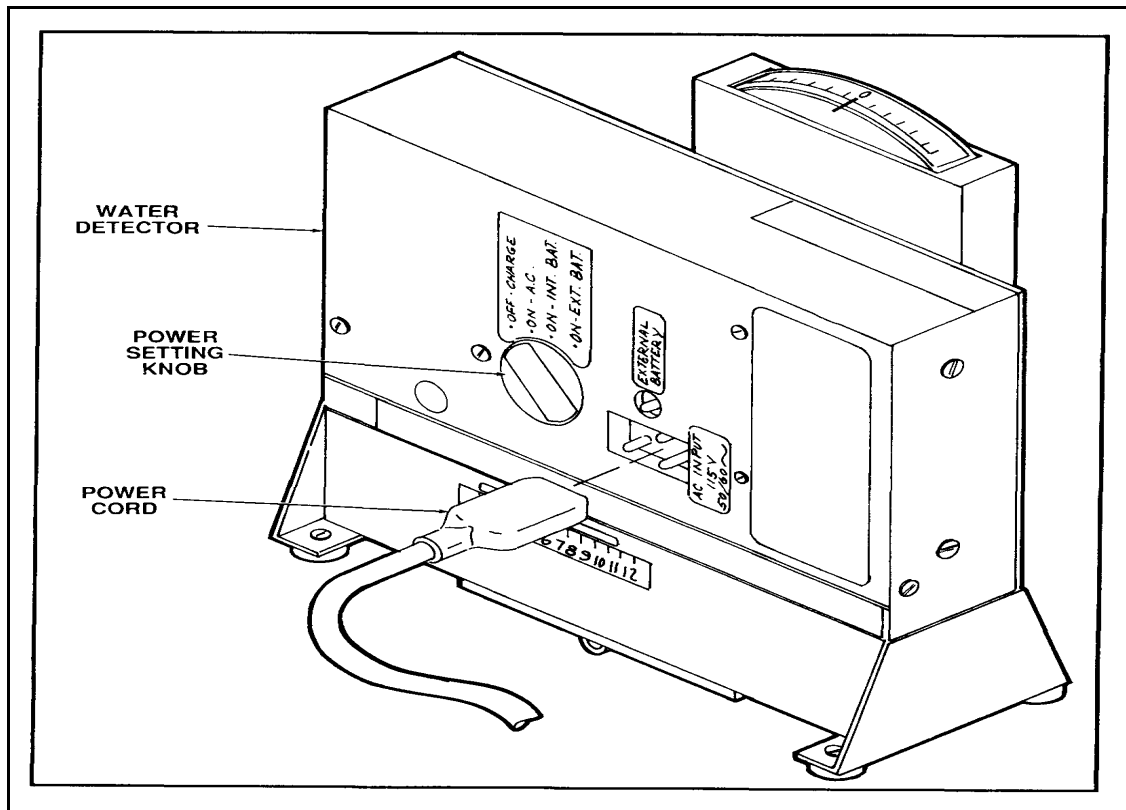


Figure E-2. AC/internal/external power settings

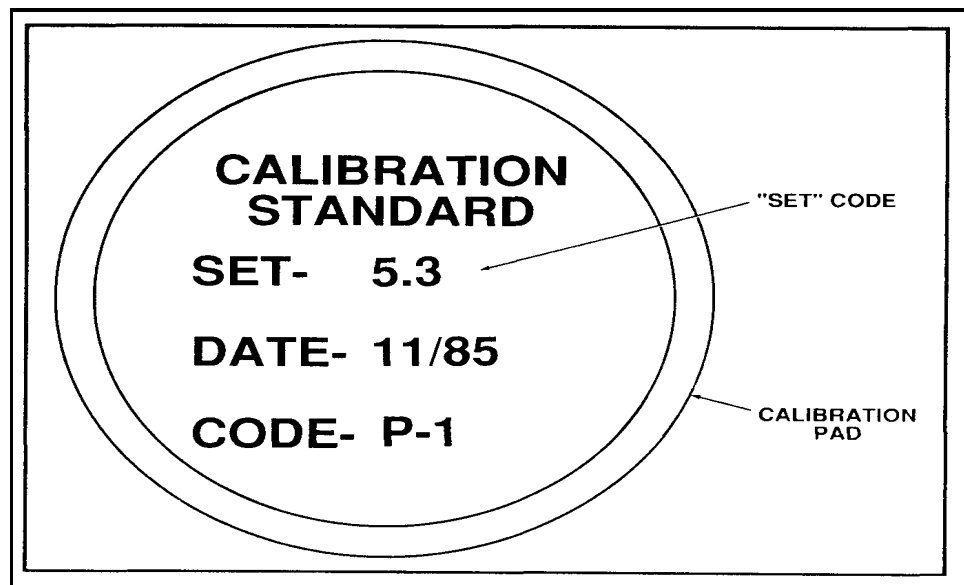


Figure E-3. Calibration pad and calibration set code

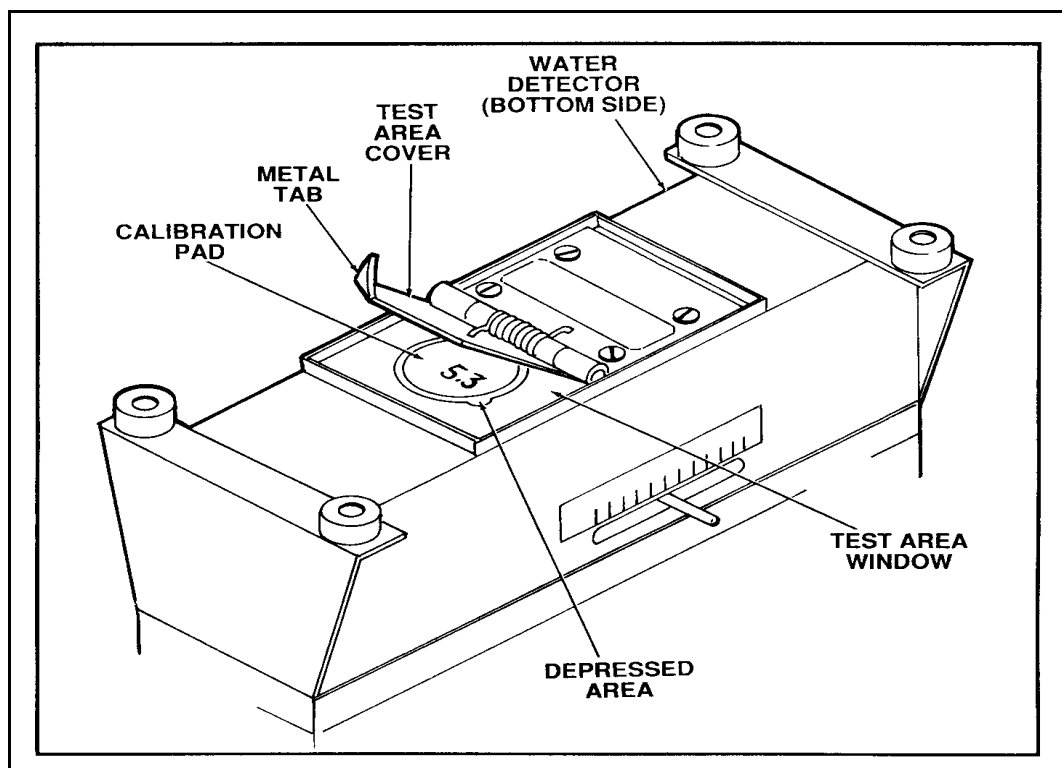


Figure E-4. Placement of calibration pad in test area window

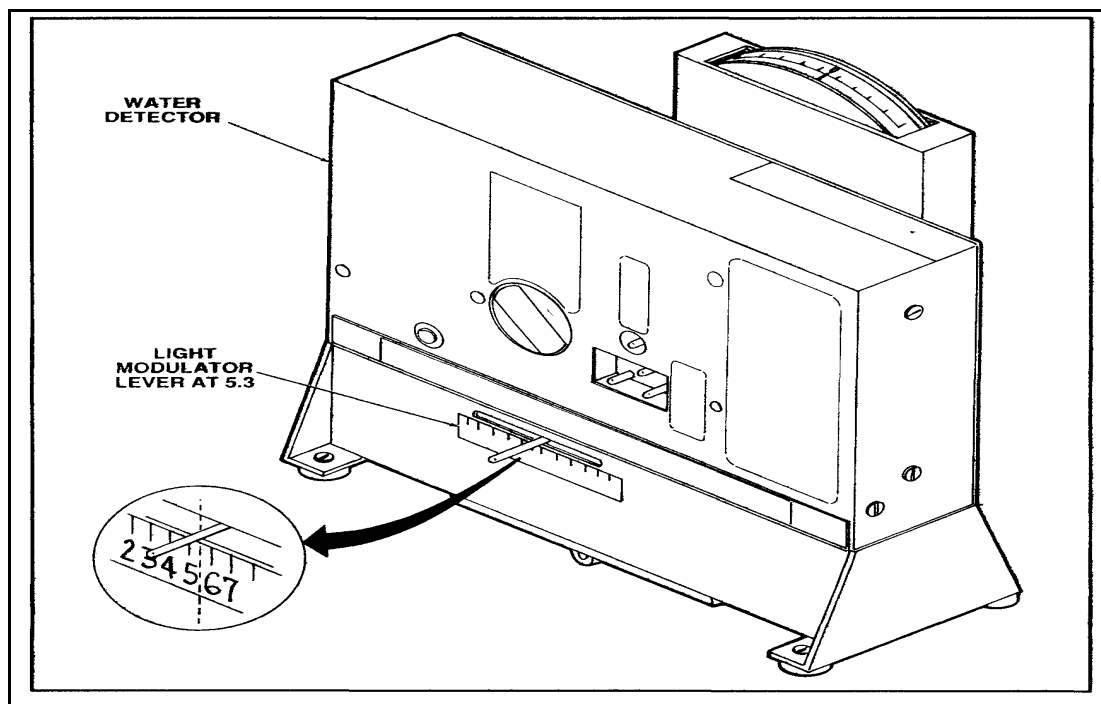


Figure E-5. Set the light-modulator lever

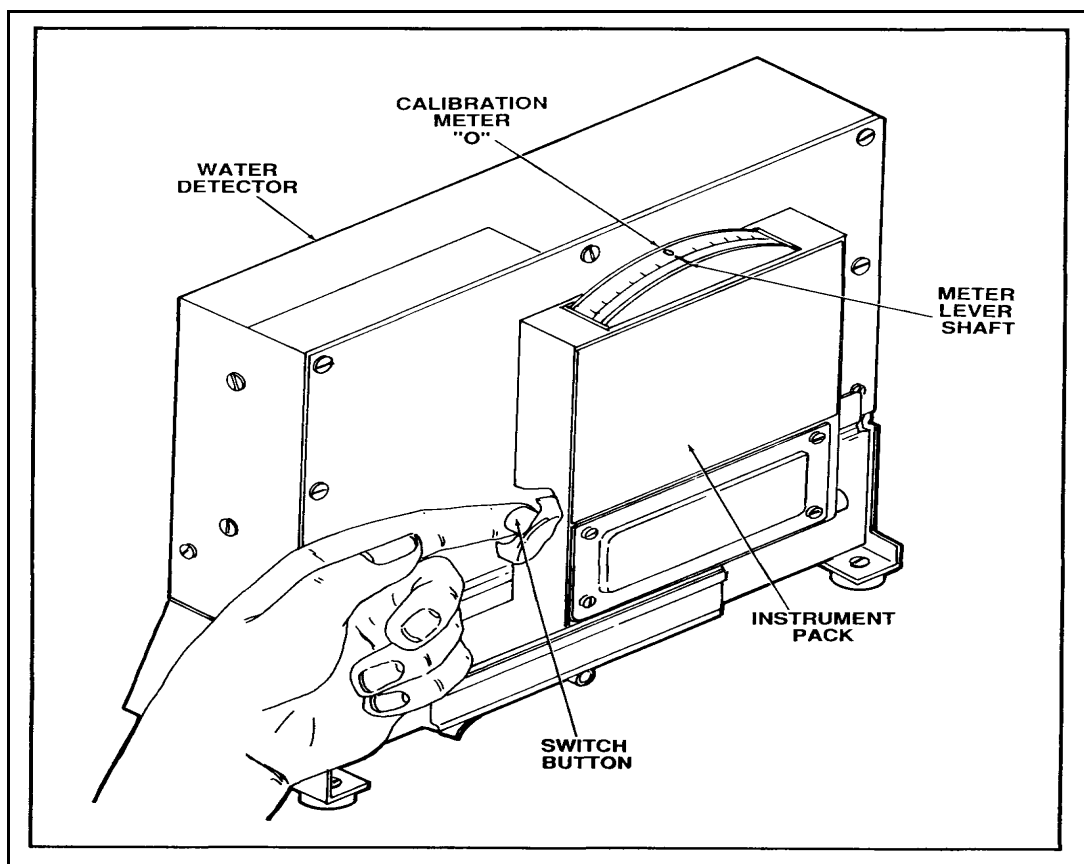


Figure E-6. Calibration meter lever shaft reading "0"

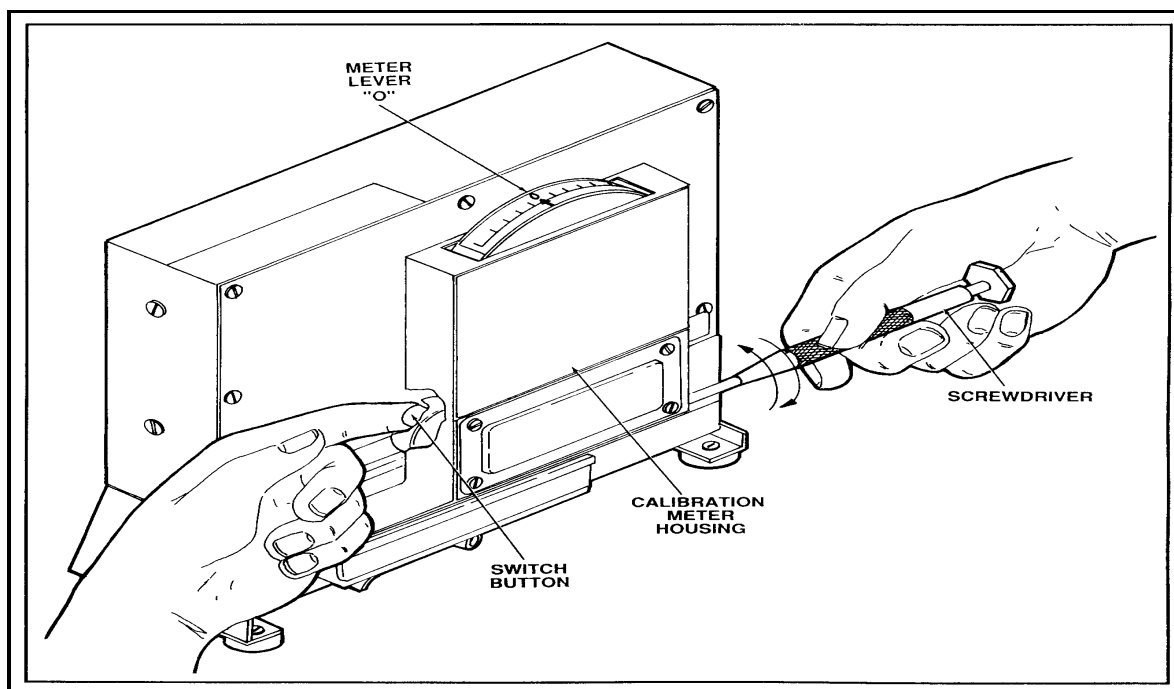


Figure E-7. Zeroing-out the meter lever

SAMPLING PROCEDURES

The sampling coupler must be permanently attached to a fuel probe mounted downstream from the filter/separator. For the test to be accurate, the sample must be taken from a moving stream of fuel. The sample should be drawn at a rate of 600 to 800 mL/minute. When sampling the fuel in a system, ensure the pump is running and at least one nozzle is open. If sampling the fuel in a filter, take the sample while recirculating the fuel before operations. Take the sample using the procedures described below.

- Couple the detector pad holder assembly, with the toggle valve closed (parallel to the line), to the sampling coupler. The detector pad holder assembly includes plastic tubing, the detector pad holder, toggle valve, and sampling coupler.
- Flush the sampling line immediately before sampling. Put the end of the plastic tubing in a container that will hold approximately 1 gallon. (Note: The amount of free water in a sample is very sensitive to the temperature of a sample. Using bottles or cans for a sample container could result in errors due to sample temperature or adsorption of water on container walls.) Open the toggle valve by turning the handle up (perpendicular to the line). Flush the detector pad assembly by displacing at least 1 liter of product. Shut the toggle valve and uncouple the detector pad assembly.
- Unscrew the two halves of the detector pad holder. Using tweezers, take the detector pad out of its envelope and put it, orange side up, in the recess in the outlet side of the holder. If the sample pad has any discoloration, unevenness in dye content, or a faded yellow appearance, select another sample pad. Screw the pad holder assembly back together. When using a three-way valve, the assembly may be flushed with the pad in place. Do not remove the test pad from the hermetically sealed envelope until ready for use. The pad can absorb moisture from the air, rain, or sneezing. Exposing the test pad to the air on a humid day will ruin the pad in a matter of minutes.
- Couple the detector pad assembly back to the sampling coupler, with the toggle valve closed, and put the end of the plastic tubing into the neck of the plastic sample bottle. Open the toggle valve and allow 500 mL of product to pass through the sample pad. Normal sample volume is 500 mL, but if the reading is off scale, sample volumes as low as 100 mL may be used.
- Close the toggle valve and uncouple the detector pad holder from the sampling coupler. Unscrew the detector pad holder. Slip one prong into the notch in the pad holder, and lift the pad out. Press the test pad between dry paper towels or blotters to remove excess fuel.

TEST PROCEDURES

Test the fuel after the equipment has been prepared and the sample is drawn. For maximum accuracy, read the test pad within three minutes after sampling is begun. Use the following procedures for testing.

- Using tweezers, put the pad in the test pad slot in the bottom of the ultraviolet lamp assembly. Ensure that the orange side faces the ultraviolet lamp. Turn on the lamp. Press the hooded button of the meter assembly while moving the light modulator lever as shown in Figure E-8, page E-7. Watch the meter scale while moving the light modulator lever until the meter pointer points to zero. Always move the modulator arm in the same direction to avoid backlash. Release pressure on the hooded button and shut the lamp switch off when the meter pointer has settled on zero. The meter pointer should stabilize in about a minute.
- Take the reading from the scale below the lever at the point where the lever crosses the scale. Record the reading and sample volume. With a 500 mL sample, the scale reads directly in PPM of free water in the fuel. If your reading is 10 PPM or below, the test is finished and the fuel may be used for Army or Air Force aircraft. Readings of 5.0 PPM or below are required for use in Navy and Marine Corps aircraft.
- If the reading is off the scale (on the high side), repeat sampling and testing procedures using a sample volume below 500 mL but no lower than 100 mL. Record the reading from the point where the lever crosses the scale, when the meter pointer points to zero, and perform the following calculation:

$$\text{Free water, ppm} = (\text{meter reading, ppm}) (500) / (\text{sample volume, mL})$$

If the retest shows more than the 10 PPM of water, submit a sample to the supporting laboratory for inspection and disposition instructions and take the fuel and refueler or fuel system out of service.

CLEANING AND MAINTENANCE

Keep the kit and its components clean. Store the components in the kit and replace components when necessary. Proper maintenance is essential. Follow cleaning and maintenance instructions in TM 10-6640-221-13&P.

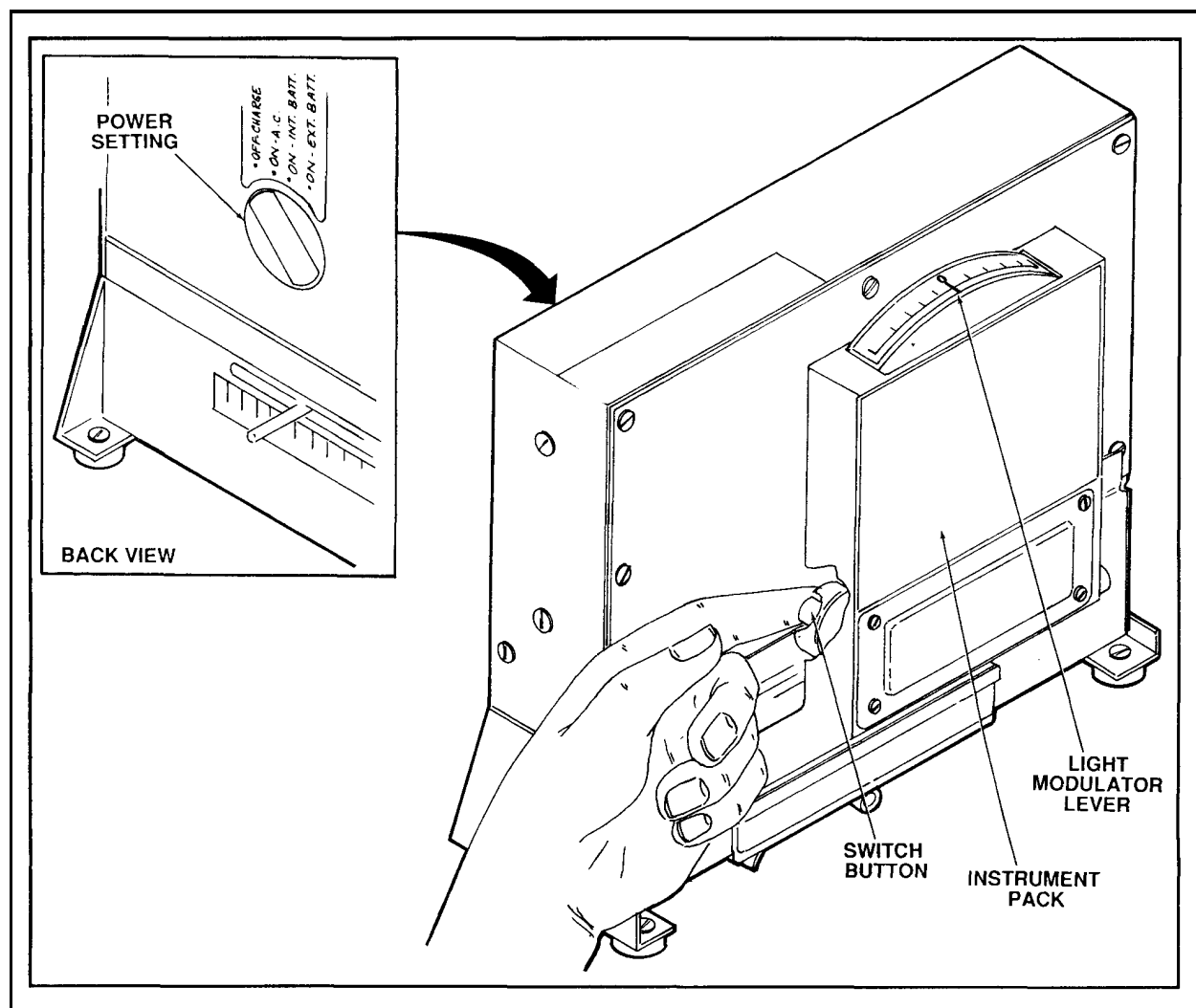


Figure E-8. Reading the undissolved water level